The Edible Solar System

Grade Level: All

Objective:
- Comprehension of the scale of the solar system and its components, including distance and diameter measurements

Arizona State Standards:
- **1SC-P2.** Compare observations of real world to observations of a constructed model. **PO 1.** Assess the capability of a model to represent a "real-world" scenario.

Time Needed: 1 class period

Introduction:
This lesson is designed to help students better understand the scale of the solar system, including distance between planetary objects and their difference in diameter.

Elementary:
Open the Edible Solar System kit and take off the lids of each of the containers. Place them where all students have access. Make copies of the Student Sheet (elementary) for each student. Students will choose the correct sized edible object to glue to the left of each planet on the list. Then they will list what object they chose in the column labeled **Object in Model**. They should use the information on the Student Sheet and a ruler to determine the correct edible object to use. The edible objects may be used for more than one planet. At this scale, a pinprick or speck of dust can be used to represent the size of Pluto. Once students have completed their sheets go over the correct answers. A yardstick may then be used to show students how far away the planets are from the sun in this scale model.

Secondary:
Start by showing the Edible Solar System poster to the class, along with the 8" diameter ball included. Explain that if the sun were the size of the ball that the planets would be these sizes relative to the sun. Make sure all of the class can see the poster and the ball. Using the Edible Solar System Student Sheet (secondary) as a guide, set the ball down on a table on one side of the room and ask the students how far away Mercury, the closest planet to the sun, would be in this model. Hold up a poppy seed at different distances from the ball. You can also ask for volunteers to come and stand where they think Mercury would be. Do the same for a few other planets, including Earth and Pluto. Before explaining Pluto's distance, show the class a yard stick for scale, then tell them that Pluto would be 1,000 yardsticks away from the ball in this model. You can relate this to a well-known landmark for more relevance. Also explain light speed as 300,000 km/s (186,000 m/s) and that light can travel 9.4 trillion km's in one year. The Earth is 8.3 light minutes away from the sun because that is how long it takes light from the sun to reach Earth. Explain that if the sun burnt out it would take 8 minutes for people on Earth to realize it.

Materials:
- 8 inch ball (provided)
- Edible Solar System poster (provided)
- Edible solar system kit (provided)
- Rulers (provided)
- Yard stick

Vocabulary:
Astronomical Unit, light speed, diameter, Proxima Centauri

References:
Adapted from The Thousand Yard Model by Guy Ottewell, 1989, ISBN 0-934546-21-5

Additional Resources:
- http://www.what-is-the-speed-of-light.com/
- http://www.exploratorium.edu/ronh/solar_system/
- http://www.vendian.org/mncharity/dir3/solarsystem/
- http://www.glyphweb.com/esky/default.htm?http://www.glyphweb.com/esky/concepts/au.html

Student Sheet – The Edible Solar System (secondary)

Planetary Object	Diameter in model	Object in model	Distance from sun in model	Actual dist. from sun (Au)	Light speed
Sun	8 inch	Yellow ball	—	—	—
Mercury	0.03 inch	Poppy seed	10 yards	0.39	3 light minutes
Venus	0.08 inch	Peppercorn	19 yards	0.72	6 light minutes
Earth	0.08 inch	Peppercorn	26 yards	1.00	8.3 light minutes
Mars	0.03 inch	Mustard seed	40 yards	1.52	12.5 light minutes
Jupiter	0.90 inch	Gum ball	132 yards	5.20	43.27 light minutes
Saturn	0.70 inch	Jacks ball or chocolate ball	244 yards	9.53	1 light hour
Uranus	0.30 inch	Sweet tart ball	493 yards	19.23	2.6 light hours
Neptune	0.30 inch	Sweet tart ball	774 yards	30.14	4 light hours
Pluto	>0.03 inch	Speck of dust	1,000 yards	39.81	5.51 light hours
End of solar system (heliopause)	—	—	293,000 yards		
Proxima Centauri	1.60 inch	Big jawbreaker	4000 miles		4.3 light years

- The distance from Proxima Centauri to the sun is the distance from New York to Los Angeles and back again
- Pluto's orbit is not in the same plane as all the other planets, it is 17° off the plane, so in this model you would have to climb a tree 200 yardsticks high and dig a hole on the opposite side of its orbit 200 yardsticks deep to accurately reflect Pluto's orbital path around the sun

Student Sheet – The Edible Solar System (elementary)

Planetary Object	Diameter in model	Object in model	Distance from sun in model	Actual dist. from sun (Au)	Light speed
Sun	8 inch		—	—	—
Mercury	0.03 inch		10 yards	0.39	3 light minutes
Venus	0.08 inch		19 yards	0.72	6 light minutes
Earth	0.08 inch		26 yards	1.00	8.3 light minutes
Mars	0.03 inch		40 yards	1.52	12.5 light minutes
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